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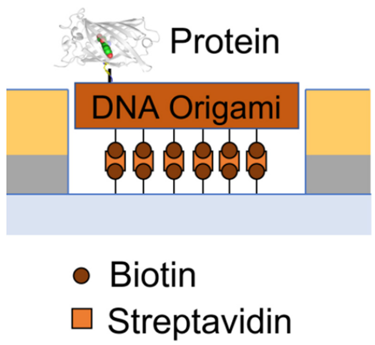
Controlling the position and orientation of biomolecules can lead to improved biochip technology.



Biomolecular arrays organize molecules onto a solid substrate and are powerful pieces for developing biochips and biosensors. At the nanoscale, they can assist with high-throughput analysis, screening large numbers of reactions or analytes. By regulating the position of the molecules, biochips can monitor multiple processes in parallel on the same platform.

Cervantes-Salguero et al. developed a scalable strategy for fabricating protein arrays that controls the position of biomolecules with nanoscale accuracy and their orientation and activity at single-molecule resolution.

"We can conceivably carry out single-molecule studies that enable the monitoring of biochemical processes in real time and measurement of molecular properties rather than their ensemble averages," said author Matteo Palma.

The team used DNA origami to build their arrays. They assembled triangles of DNA to serve as a scaffold, which they linked to single proteins, then organized onto prepatterned surfaces.

"With our strategy, we could position individual proteins in an array and control their orientation by controlling the linking point of the protein to the DNA triangle," said Palma. "This is of general applicability to any biomolecule of interest and could be used to fabricate high-throughput nanoscale platforms for fundamental biological investigations and sensing experiments with unprecedented resolution and sensitivity."

Some challenges remain at the engineering level, such as optimizing the yield of controlled protein attachment, organizing the DNA triangle in the array, and reducing the cost and time of chip fabrication.

The researchers aim to employ similar strategies to control the assembly and organization of nanostructures of interest in different fields of nanoscience and nanotechnology.

Source: "Single molecule DNA origami nanoarrays with controlled protein orientation," by K. Cervantes-Salguero, M. Freeley, R. E. A. Gwyther, D. D. Jones, J. L. Chavez, and M. Palma, *Biophysics Reviews* (2022). The article can be accessed at https://doi.org/10.1063/5.0099294.